

# Creativity and the future of skills

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## 1

### Creativity in work matters

At a time when all jobs, whether in a coffee shop or a bank, can seemingly be described as creative, you'd be forgiven for thinking the word had lost all meaning in the labour market.<sup>1</sup>

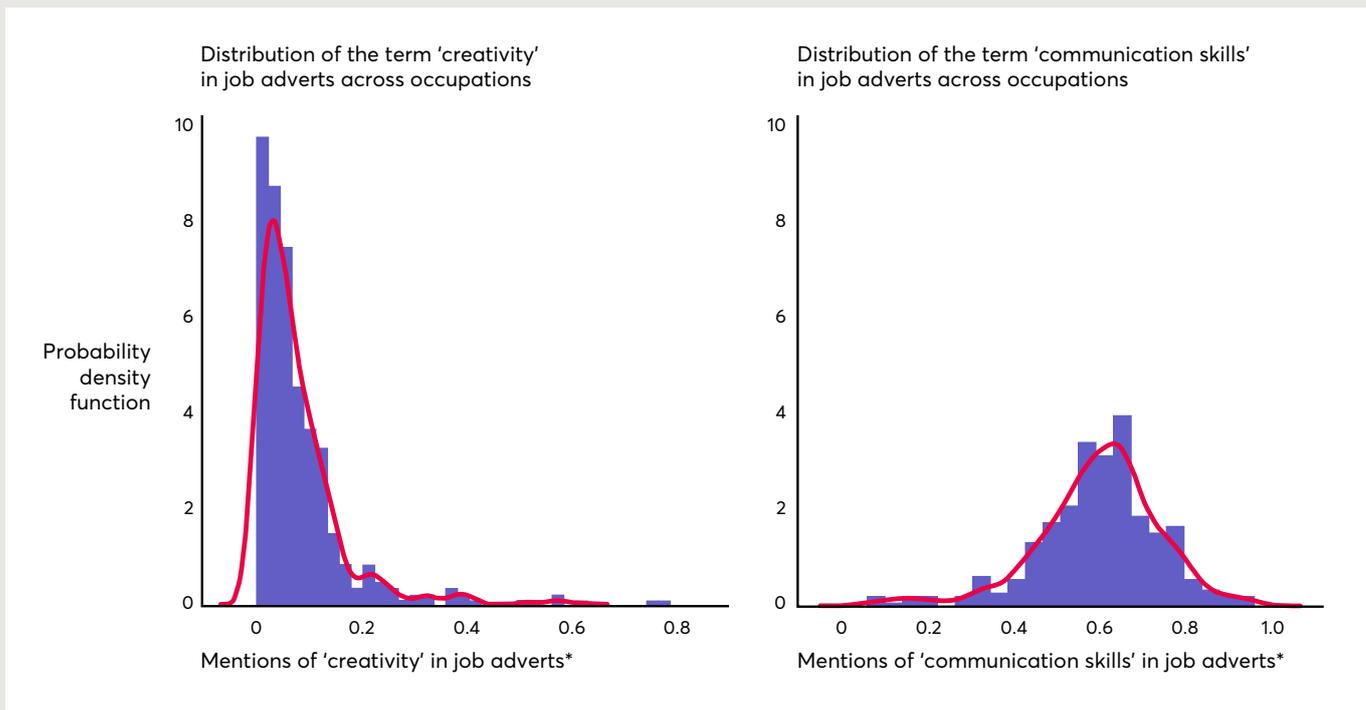
If this is the case, then what does that mean for the 'Creative Industries', a sector defined by employment of creative talent?<sup>2</sup>

In order to understand how the word 'creativity' is really being used in the job market, and whether its importance will lessen or grow, we look at 35 million UK job adverts from 2013-2017 inclusive, and the relative importance of the word 'creativity' within them (both frequency of use within the adverts, and proportion of adverts using the word). The data are sourced from Burning Glass Technologies.

What we find may surprise the cynics. As shown in Figure 1, while there is a strong demand for creativity in a small number of occupations, it is barely mentioned in job adverts for the vast majority. Take the example of Graphic designers. Job adverts for this occupation are

much more likely to mention creativity than Medical practitioners (20 times more likely), Management consultants and business analysts (13 times more likely) and Research and development managers (four times more likely). Technically, the distribution is heavily right skewed. In this regard, 'creativity' isn't a term like 'communication skills' - another transferable skill - that is used so commonly in adverts that it risks being meaningless.

Figure 1. Distributions of the terms 'creativity' and 'communication skills' in job adverts



\*Shown are the relative frequencies of mentions of 'creativity' and 'communication skills' in job adverts in 2017.

Despite being used in adverts for occupations across the workforce the **requirement for 'creativity' is 4.3 times more important in adverts for occupations on the Department for Digital, Culture, Media and Sport (DCMS) list of 'Creative Occupations'**.<sup>3,4</sup> This list includes roles like designers, artists, jobs in advertising and architects, as well as software and web development professionals.

Exceptions to this rule - namely DCMS Creative Occupations mentioning creativity less frequently in their job adverts - include Town planning officers, and Information technology and telecommunications directors.

We can also investigate the relationship between Creative Occupations and their future growth prospects. To do this we use the UK findings from Nesta's published research on the future of skills, carried out in partnership with education company Pearson.<sup>5</sup> This uses a combination of machine learning techniques and expert judgement to predict which jobs are most and least likely to grow as a percentage of the workforce by 2030.

Of the 39 transferable skills we consider, 'creativity' is consistently the **most significant predictor for an occupation's chance of growing**, as a percentage of the workforce by the year 2030 (Table 1). This result holds for each of the five years in our sample.

Table 1. Regression of occupations' probability of growth on mentions of transferable skills in job adverts in 2013-2017

Dependent variable: Occupations' probability of growth	2013	2014	2015	2016	2017
Analytical skills	-0.001 (0.011)	-0.003 (0.013)	0.002 (0.011)	-0.009 (0.013)	-0.007 (0.012)
Articulate	-0.009 (0.009)	-0.009 (0.009)	-0.008 (0.009)	-0.011 (0.009)	-0.007 (0.009)
Building effective relationships	-0.0061 (0.010)	-0.011 (0.011)	-0.017 (0.011)	-0.011 (0.011)	0.006 (0.011)
Business management	0.001 (0.011)	0.001 (0.012)	-0.005 (0.011)	0.012 (0.012)	0.001 (0.011)
Communication skills	0.019* (0.010)	0.015 (0.01)	0.020** (0.01)	0.023** (0.01)	-0.002 (0.01)
Basic computer skills	-0.039*** (0.009)	-0.039*** (0.009)	-0.029*** (0.009)	-0.026*** (0.009)	-0.017* (0.009)
Creativity	0.035*** (0.009)	0.032*** (0.009)	0.034*** (0.009)	0.042*** (0.009)	0.039*** (0.009)
Customer contact	-0.002 (0.008)	0.000 (0.008)	0.010 (0.009)	0.020** (0.009)	0.008 (0.009)
Customer service	-0.021** (0.010)	-0.041*** (0.01)	-0.025** (0.01)	-0.034*** (0.01)	-0.027** (0.011)
Data analysis	0.017** (0.009)	0.014 (0.009)	0.017* (0.009)	0.011 (0.009)	0.017** (0.008)
Decision making	0.009 (0.008)	0.004 (0.009)	0.018** (0.008)	0.013 (0.008)	0.006 (0.009)
Detail-oriented	-0.036* (0.010)	-0.042*** (0.011)	-0.042*** (0.012)	-0.048*** (0.012)	-0.050*** (0.012)
English	0.005 (0.009)	-0.001 (0.01)	0.004 (0.009)	0.002 (0.01)	0.010 (0.009)
Leadership	-0.012 (0.009)	-0.003 (0.009)	-0.004 (0.009)	0.005 (0.009)	-0.008 (0.009)
Management	0.022** (0.010)	0.018 (0.012)	0.040*** (0.012)	0.017 (0.011)	0.003 (0.01)
Mathematics	-0.001 (0.009)	-0.014 (0.009)	-0.008 (0.009)	0.002 (0.009)	-0.003 (0.008)
Meeting deadlines	-0.010 (0.008)	-0.004 (0.009)	-0.010 (0.01)	-0.013 (0.011)	-0.015 (0.01)
Mentoring	0.012 (0.007)	0.001 (0.008)	0.010 (0.007)	0.010 (0.008)	0.022** (0.009)
Microsoft Excel	-0.019 (0.013)	-0.014 (0.013)	-0.015 (0.013)	-0.000 (0.013)	0.002 (0.012)
Microsoft Office	0.027** (0.013)	0.018 (0.014)	0.020 (0.013)	0.013 (0.012)	0.002 (0.011)
Microsoft PowerPoint	-0.014 (0.011)	-0.025** (0.012)	-0.007 (0.011)	-0.005 (0.011)	-0.018* (0.011)
Microsoft Word	-0.006 (0.010)	0.002 (0.012)	-0.006 (0.01)	-0.012 (0.011)	0.002 (0.01)
Multi-tasking	0.012 (0.009)	0.006 (0.009)	0.010 (0.009)	0.009 (0.009)	0.0151* (0.009)
Organisational skills	0.028*** (0.009)	0.023** (0.009)	0.014 (0.009)	0.004 (0.008)	0.015* (0.009)
Planning	0.006 (0.009)	0.005 (0.01)	0.001 (0.01)	0.003 (0.01)	0.001 (0.009)
Positive disposition	-0.022** (0.008)	-0.009 (0.009)	-0.020** (0.009)	-0.016* (0.009)	-0.013 (0.009)
Presentation skills	0.016 (0.011)	0.013 (0.011)	0.019* (0.01)	0.014 (0.01)	0.011 (0.011)
Prioritising tasks	-0.013 (0.008)	-0.009 (0.009)	-0.012 (0.008)	-0.016** (0.008)	-0.017* (0.009)
Problem solving	0.013 (0.009)	0.010 (0.01)	-0.000 (0.009)	0.011 (0.009)	0.012 (0.009)
Project management	-0.001 (0.010)	0.003 (0.01)	-0.000 (0.01)	0.002 (0.01)	0.006 (0.01)
Quick learner	-0.024** (0.009)	-0.004 (0.009)	-0.013 (0.009)	-0.006 (0.008)	-0.012 (0.008)
Research	0.003 (0.009)	0.007 (0.01)	0.006 (0.009)	0.008 (0.009)	0.003 (0.009)
Self-starter	-0.012 (0.009)	-0.005 (0.008)	-0.014 (0.009)	-0.006 (0.01)	-0.001 (0.01)
Supervisory skills	-0.009 (0.008)	-0.015* (0.009)	-0.020** (0.009)	-0.007 (0.009)	-0.001 (0.008)
Teaching	0.010 (0.012)	-0.002 (0.012)	0.001 (0.012)	0.003 (0.012)	0.006 (0.012)
Team building	0.014 (0.009)	0.014 (0.01)	0.006 (0.01)	0.004 (0.01)	0.020** (0.008)
Teamwork / collaboration	-0.007 (0.008)	-0.013 (0.009)	-0.005 (0.009)	-0.020** (0.009)	-0.014 (0.009)
Time management	0.008 (0.008)	0.004 (0.009)	-0.002 (0.008)	0.016** (0.008)	0.028*** (0.008)
Writing	-0.002 (0.009)	-0.017* (0.009)	-0.004 (0.009)	-0.005 (0.009)	-0.005 (0.009)
Observations	350	350	350	350	350
R-squared:	0.479	0.453	0.474	0.487	0.512
Adj. R-squared:	0.414	0.384	0.408	0.422	0.451
AIC:	-399.8	-382.3	-396.3	-404.8	-422.5

Notes: Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The number of observations (350 out of 369) denotes the number of occupations that are well represented in our dataset. Highlighted are skills that are significant predictors of occupations' probability of growth in every year over the five-year period.

In contrast to Creativity, some transferable skills, like being Detail-oriented, having Customer service skills and Basic computer skills, are actually negatively correlated with an occupation's growth outlook.

This makes sense, given the changing world of work. Hiring a writer who is 'Detail-oriented' might not be so important when they have a spell checker on their computer. It will be their Creativity that sets them apart. Although interpersonal skills are predicted to be in high demand in the future, many customer-facing jobs on the high street have in recent decades been replaced due to automation (think of supermarket checkouts) or have gone online. And routine-intensive 'Basic computer skills' are often associated with jobs that are likely to be automated - something we explore further in Nesta's report [Which digital skills do you really need?](#)

## 2

### Complements to creativity

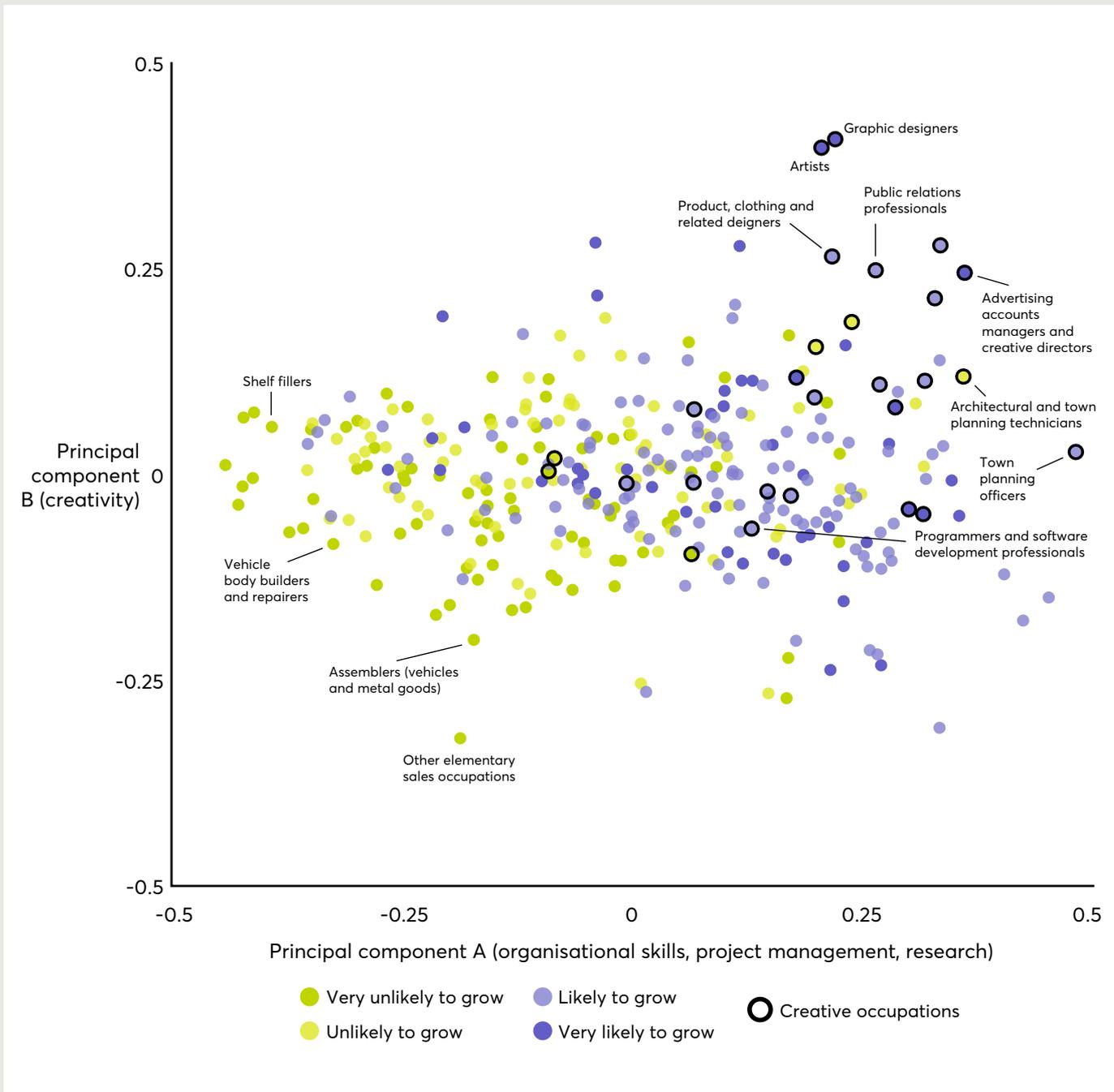
Alongside creativity, skills related to organisation and management are positively correlated with an occupation's probability of growth. Furthermore, we find that project management and organisational skills (and research skills) are important complements to creativity, leaving creative jobs with even better prospects.

This should come as no surprise to those familiar with creative work, where production is often project-based, bringing diverse talents to work together, and therefore requiring strong project management skills.<sup>6</sup>

To identify the importance of these complementary skills we use a technique called Principal Component Analysis (PCA). This allows us to identify relationships between different transferable skills and examine the importance of these skills to any given occupation.

As you can see from the graph below (Figure 2), Creative Occupations in the DCMS list (identified by their highlighted outline) make disproportionate use of both 'creativity' and Organisational skills. These occupations are also predicted with greater probability to grow in the future (shown in purple). Green circles signify those occupations that are unlikely to grow - and they tend to require fewer creative or Project management skills.

Figure 2. Projections of 4-digit SOC occupations on the two principal components



Notes: The likelihood of growth is measured based on a probability that an occupation will grow its share of the workforce by 2030. 'Very unlikely to grow' - probability is below 0.35. 'Unlikely to grow' - probability is greater or equal to 0.35, but less than 0.50. 'Likely to grow' - probability is greater or equal to 0.50, but less than 0.65. 'Very likely to grow' - probability is greater or equal to 0.65.

## 3

## The hidden creatives

The DCMS Creative Occupations do not have a monopoly on the use of the word 'creativity'. Using job adverts we find several other occupations where their content might lead you to think of them as being creative occupations.

First, we found those occupations that 'looked similar' to known Creative Occupations using the relative demand for creativity in job adverts. Specifically, we asked which jobs outside of the DCMS Creative Occupations list frequently ask for creativity?

These 'self-declared' creative jobs include:<sup>7</sup>

- Florists
- Print finishing and binding workers
- Bakers and flour confectioners
- Chefs
- Hairdressers and barbers

We needn't restrict our analysis to job adverts using the word 'creativity'. Another approach to finding 'hidden creatives' is to look for occupations that use similar technical skills to roles in Creative Occupations (on the grounds that sets of technical skills help to differentiate roles).

To compare occupations with similar technical skills, we use the skills taxonomy that Nesta has recently produced for the Office for National Statistics' Economic Statistics Centre of Excellence (ESCoE). The taxonomy enables us to represent each occupation as a distribution over 143 different skill clusters which they may draw upon. To illustrate, Table 2 shows the most prominent skill clusters for several job titles that are classed as being Creative Occupations. The percentage values denote the proportion of job adverts with a given job title that are assigned to a particular skill cluster.

Table 2: The skill composition for several creative jobs

Creative job title	Most prominent skill clusters (per cent)*
<b>Animator</b>	('animation', 78.7), ('graphic and digital design', 17.0)
<b>Artist</b>	('graphic and digital design', 33.5), ('animation', 31.0), ('multimedia production', 11.0), ('general sales', 5.0), ('retail management', 2.5), ('event planning', 1.5), ('software development', 1.5), ('construction', 1.0), ('design and process engineering', 1.0), ('social work and caregiving', 1.0), ('business management', 1.0)
<b>3D designer</b>	('graphic and digital design', 38.7), ('design and process engineering', 22.4), ('animation', 18.5), ('construction engineering', 10.9)

\*Shown are the skill clusters that in total account for at least 90 per cent of job title composition by third layer clusters in the skills taxonomy (Djumalieva and Sleeman, 2018).

The extent to which the skills required for two different occupations overlap is measured using the cosine similarity between the skills clusters that they draw upon.

Table 3 below shows examples of job titles whose technical skill requirements closely resemble those found in jobs that are already part of Creative Occupations.<sup>7</sup>

Table 3: Other Occupations with similar skills requirements to Creative Occupations

Creative Occupations	Occupations with similar skill requirements
Architecture occupations	<ul style="list-style-type: none"> <li>• Building and civil engineering technicians</li> <li>• Estimators, valuers and assessors</li> <li>• Chartered surveyors</li> </ul>
Film, TV, video, radio and photography occupations	<ul style="list-style-type: none"> <li>• TV, video and audio engineers</li> </ul>
Museums, galleries and libraries occupations	<ul style="list-style-type: none"> <li>• Library clerks and assistants</li> </ul>
Advertising and marketing occupations	<ul style="list-style-type: none"> <li>• Sales accounts and business development managers</li> <li>• Conference and exhibition managers and organisers</li> </ul>
Design occupations	<ul style="list-style-type: none"> <li>• Print finishing and binding workers</li> </ul>
Craft occupations	<ul style="list-style-type: none"> <li>• Manufacturing occupations (e.g. Footwear and leather working trades)</li> </ul>
Music, performing and visual arts occupations	<ul style="list-style-type: none"> <li>• Education professionals</li> </ul>

## 4

### Conclusion and policy lessons

This paper has three key lessons for policymakers:

#### 1. Creativity is likely to become even more important in the future job market

Although it may seem ubiquitous, far from every job advert lists 'creativity' as a requirement. In fact, job adverts for the DCMS Creative Occupations official list are still far more likely to ask for it. Strikingly, jobs asking for creativity are also much more likely to grow as a percentage of the workforce by the year 2030. This reinforces the finding from previous research that policymakers should be investing in the workforce's creative skills.

#### 2. Employers don't just value creativity alone: they need talent with project management and organisational skills too

Our analysis suggests that strong project management and organisational skills, when combined with creativity, will be a particularly potent mix in the future. This should be a key takeaway for anyone involved in training or education policy.

#### 3. Creative occupations don't have a monopoly on creativity

Creativity is not confined to the list of Creative Occupations compiled by the DCMS. Education and skills policymakers should look beyond sectoral boundaries when formulating policies to invest in the workforce's creativity.

Jobs for which employers request creativity at a similar rate as those in the DCMS list include: Bakers and flour confectioners, Chefs, Florists, Hairdressers and barbers, Print finishing and binding workers.

We also find jobs that have a lot in common with Creative Occupations due to the technical skills required. Examples of these jobs include engineers, manufacturing and business development roles. This is something for the Department for Education and other skills leads to consider when developing reskilling policies.

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# 5

## Methodology

### Data

The data that we used for the analysis was collected between 2013 and 2017 by Burning Glass Technologies, a labour market analytics software company. For each job posting, Burning Glass identified and extracted skills that had been mentioned in the advert. There are 11,425 unique skills mentioned across all job adverts. In this context, 'skills' is a broad term that refers to all employer requirements including knowledge and competences. Burning Glass also assigns adverts to 4-digit SOC 2010 and we use the provided codes for the purposes of the analysis.

### Measuring similarities between occupations

In our work for ESCoE on developing a data-driven skills taxonomy for the UK we identified a set of transferable skills, that are in high demand across all occupations. We grouped the remaining more technical skills into hierarchical clusters to form a skills taxonomy. For this analysis, we measured the similarity of occupations, with regard to both technical and transferable skills. The motivation for comparing skill requirements across occupations was to identify hidden creatives, which are the occupations that rely on similar technical skills or require creativity, but are not included in the DCMS list of Creative Occupations.

It is worth noting that there are a number of limitations to studying skill requirements for occupations using online job adverts. Certain occupations are not well represented in online job adverts. This might, for example, be due to the fact that a small number of people are employed in these occupations. Because of this, we do not have a sufficient number of online job adverts for two occupations in the DCMS list: Chartered architectural technologists and Weavers and knitters. Another reason for the imperfect coverage is that for certain occupations the majority of workers are freelancers and therefore there are fewer online adverts for these jobs. Due to this, we are not likely to accurately capture skills required for craft occupations.

## Identifying transferable skills most associated with a bright occupation outlook

We have also explored the relationship between transferable skills mentioned in job adverts across occupations and the growth outlook of these occupations based on the Future of Skills research by Bakhshi et al. (2017). To identify transferable skills that are consistently associated with better growth prospects, we fit an Ordinary Least Squares regression, where relative frequency of mentions of transferable skills are used as independent variables and the occupations' probability of growth is the dependent variable. Relative frequency of mentions is calculated using a technique called term frequency - inverse document frequency (tf-idf). Tf-idf measures the importance of terms (e.g. individual transferable skills) in a corpus (all transferable skills in job adverts). This statistic is often used to discount ubiquitous terms that occur in many documents. We run the regression analysis separately for each of the five years in our sample and compare results.

## Complementarities between transferable skills

To investigate the extent to which transferable skills complement each other, we have used a Principal Component Analysis (PCA) technique. PCA enables us to capture an underlying structure of data and identify some core dimensions (or components) along which observations vary the most. The analysis also shows which variables contribute the most to a given component and provides us with insights on complementarities between the variables. For our data, we find that ten components capture 79 per cent of variance across 39 variables (individual transferable skills). The component that explains the greatest proportion of variance across occupations relates to the skills needed to deliver complex projects. The transferable skills that contribute the most to this component are organisational skills, project management and research. There is another component that is predominantly described by the variance in the relative frequency of the word 'creativity' in job adverts.

This is exploratory analysis that takes a novel approach. At Nesta we will continue to study the demand for skills and the future of work, which is in itself a shifting landscape.

## 6

## Appendix

i) List of occupations that have similar skill requirements to Creative Occupations, with their 4-digit SOC 2010 code

- Building and civil engineering technicians (3114)
- Estimators, valuers and assessors (3531)
- Chartered surveyors (2434)
- TV, video and audio engineers (5244)
- Library clerks and assistants (4135)
- Sales accounts and business development managers (3545)
- Conference and exhibition managers and organisers (3546)
- Print finishing and binding workers (5423)
- Manufacturing occupations (e.g. Footwear and leather working trades 5413)
- Florists (5443)
- Print finishing and binding workers (5423)
- Bakers and flour confectioners (5432)
- Chefs (5434)
- Hairdressers and barbers (6221)

ii) Transferable skills were identified as a part of Nesta's work for ESCoE on building a skills taxonomy. We have removed several broad technical skills (e.g. sales, budgeting) so that the remaining skills were as cross-sectoral as possible.

## Endnotes

1. Mould, O. (2018), 'Against Creativity, Verso'. Mould's thesis more generally is that the language of creativity is abused by governments and employers.
2. Bakhshi, H., Freeman, A. and Higgs, P. (2013). 'A Dynamic Mapping of the UK's Creative Industries'. London: Nesta.
3. List of Creative Occupations is available in Annex B - DCMS, Creative Industries Economic Estimates (January 2016) [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/523024/Creative\\_Industries\\_Economic\\_Estimates\\_January\\_2016\\_Updated\\_201605.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/523024/Creative_Industries_Economic_Estimates_January_2016_Updated_201605.pdf)
4. Importance is defined as relative frequency of skill mentions. It is calculated using a technique called term frequency - inverse document frequency (tf-idf).
5. Bakhshi, H., Downing, J., Osborne, M. and Schneider, P. (2017). 'The Future of Skills: Employment in 2030'. London: Pearson and Nesta. [https://media.nesta.org.uk/documents/the\\_future\\_of\\_skills\\_employment\\_in\\_2030\\_0.pdf](https://media.nesta.org.uk/documents/the_future_of_skills_employment_in_2030_0.pdf)
6. Caves, R. (2000). 'Creative Industries: Contracts Between Art and Commerce'. Harvard University Press.
7. All SOC codes available in the Appendix.

# Creative Industries Policy & Evidence Centre

Led by **nesta**

The Creative Industries Policy and Evidence Centre (PEC) works to support the growth of the UK's creative industries through the production of independent and authoritative evidence and policy advice.

Led by Nesta and funded by the Arts & Humanities Research Council as part of the UK Government's Industrial Strategy, the Centre comprises of a consortium of universities from across the UK (Birmingham; Cardiff; Edinburgh; Glasgow; Work Foundation at Lancaster University; LSE; Manchester; Newcastle; Sussex; Ulster). The PEC will work with a diverse range of industry partners including the Creative Industries Federation.

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